Fluoride and fluoridation

Is there anything more to be said about fluoridation? Probably not, however here is an update from Water Technology’s May 2011 report.

What it is:
- Fluorine is the most active halogen and element nine in the periodic table. Fluoride is its anion with a charge of -1.
- Fluoride is ubiquitous in the environment in water, rocks, plants and animals in small amounts.
- It deposits in bone and in teeth as the fluorapatite mineral Ca₅(PO₄)₃F — a very hard crystalline compound.
- Many types of toothpaste are fluoridated.

What is the fluoride/fluoridation issue?
- Beginning in 1941, tooth decay studies in several Midwestern communities noted reduced incidence of dental caries when higher levels of fluoride were present in their drinking water.
- Many communities began to add fluoride to their drinking waters at about 1 ppm, either as sodium fluoride or fluosilicic acid.
- Numerous dental organizations advocate controlled fluoridation of drinking water; some states require fluoridation of water, and others have it as a community option. The federal government cannot require the addition of fluoride to drinking water for therapeutic purposes. However, governmental organizations such as the Centers for Disease Control and Prevention and the National Institute of Dental Research advocate its addition to reduce tooth decay in children.
- Some advocacy groups have consistently opposed drinking water fluoridation as an involuntary medication, a possible risk and unnecessary because dental decay rates have been dropping even in non-fluoridated communities.

Health considerations:
- Excessive fluoride in some world drinking water sources can cause crippling skeletal fluorosis or osteomalacia, which are serious bone and joint malformations.
- Drinking water levels on the order of 1 or 2 to 4 mg/l can cause dental fluorosis ranging from very mild to moderate to severe, depending upon the amount of water consumed as well as total fluoride intake from all sources.
- Fluoride has been tested in animals extensively without significant negative outcomes.
- The cancer bioassay in rats and mice showed no increased cancer risk, but with equivocal evidence.
- Therapeutic doses of fluoride have been used in osteoporosis treatment, however beneficial effects have been marginal and sometimes increased risk of bone fracture was noted.

Analytical methods:
- Fluoride is analyzed by ion selective electrodes and ion chromatography.

Water treatment:
- Fluoride can be removed from water by lime precipitation, anion exchange with alumina, bone char and reverse osmosis (RO). Alumina and RO are available POU methods.

National trends:
- Fluoridation is widely practiced around the world but some countries such as Sweden, Holland and Czech Republic, have banned it.
- The Israeli Health Minister recently announced a ban, but the current Prime Minister Netanyahu had endorsed fluoridation when he was health minister and advocated for a community option.

Regulation:
- The Primary Drinking Water Regulation for total fluoride is 4 mg/l; the secondary (esthetic) regulation is 2 mg/l. The World Health Organization Guideline is 1.5 mg/l, which should be adjusted relative to climate and water consumption.
- CDC recommends fluoridation at 0.7 mg/l to minimize mild dental fluorosis while maintaining dental benefits.

Conclusion:
- Fluoridation is still debated but most public health authorities support it because of the benefits of reduced tooth decay among children, especially among lower income groups who do not receive regular dental care.

Dr. Cotruvo is president of Joseph Cotruvo and Associates, LLC, Water, Environment and Public Health Consultants. He is a former director of the U.S. EPA Drinking Water Standards Division.
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